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How Teachers Prepare to Work in Indigenous Education: A Case Study

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This paper presents a case study aimed at investigating the training of teachers within an indigenous education institution. The study conducted semi-structured interviews with 10 teachers from various fields working in an institution situated in the Nasa territory of the Cauca department in Colombia. This institution serves a diverse population including peasants, Nasa indigenous people, and Afro-descendants. The research methodology employed discourse analysis for data interpretation. The primary conclusion drawn from this study underscores a noticeable absence of intercultural training among teachers working within such institutions. Despite this deficiency, the teachers' practical experience and the unique context in which they operate allow for a meaningful exchange of knowledge. This dynamic enables the integration of teaching methods that align with the indigenous education model. Consequently, this exchange of knowledge contributes to the empowerment and cohesion of the Nasa community.

Keywords: *Teaching; quality of the education; intercultural education; teacher training; ethnic education.*

Introduction

Colombia, as enshrined in the Political Constitution of 1991 (Const, 1991), stands as a diverse and multi-ethnic nation (Castro, 2004). This is evidenced by the presence of numerous ethnic groups, composing an estimated population of 1,905,617 individuals (DANE, 2019). This populace is characterized by the coexistence of 64 distinct languages, dispersed across approximately 200 municipalities. Despite this remarkable cultural tapestry, there exists a noticeable dearth of comprehensive studies that delve into the ethnomathematics framework of various indigenous communities (Tabares, 2016).

It is only within recent years that the concept of ethno-education has started to gain prominence. This approach seeks to establish a harmonious and dialogic relationship between cultural heritage and formal schooling, accentuating the significance of traditions, language, and ancestral knowledge (Castillo, 2016; Sánchez, 2018; Jacanamejoy, 2021). Notably, ethnomathematics has been integrated into this discourse, as it provides a conduit for recognizing and appropriating indigenous and cultural mathematical knowledge.

Historically, Blanco (Blanco, 2017; Blanco & Molano, 2021) highlights the emergence of what can be deemed as the embryonic stages of ethnomathematics in

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Colombia during the 1980s. This period witnessed the collaborative efforts of three pioneering researchers: German Mariño, Víctor Albis, and Guillermo Páramo, who amalgamated the realms of mathematics and anthropology. In the words of Blanco, "Ethnomathematics examines cultural practices, which stem from the imperative to solve problems interwoven with mathematical relationships" (Blanco et al, 2014).

Tabares (2016) underscores that Colombia is lagging behind in the realm of ethnomathematics, attributing this disparity to a broader context where the understanding of ancestral cultural identity is overshadowed by the prevailing dominance of Eurocentric knowledge in Latin America (Walsh, 2007). Furthermore, despite the nation's rich cultural diversity and the existence of varying regional knowledge, ethnomathematics remains marginalized in teacher training programs, consequently failing to effectively enrich education for different communities (Aroca, 2016).

Aroca provides an overview of the state of ethnomathematics within mathematics teacher training programs in Colombia, characterizing it as being in an incipient yet growing phase (Aroca, 2016). Through an examination of the curricula in 14 public universities, Aroca finds that only 3 out of these institutions incorporate ethnomathematics as a compulsory course for future mathematics teachers. In 7 universities, the course is offered as an elective, while in 4, it is not provided at all. This scarcity in ethnomathematics training for prospective mathematics teachers exposes a significant gap in their education, reflecting a failure to contribute to the exploration, preservation, and strengthening of ancestral and cultural mathematical knowledge within the country.

Another challenge stems from the epistemological perspective held by both teacher trainees and educators. Gatti (1992) and Ruiz (2018) point out that many universities educators struggle with a dilemma of teaching identity, vacillating between being specialists in their field of expertise or being effective educators. This crisis of teaching identity is perpetuated by passing it down to their trainees, focusing predominantly on discipline-specific knowledge and sidelining the critical nuances essential for 21st-century teaching, such as the promotion of interculturality and its vital role in shaping the education of mathematics teachers. This disregard for the evolving theoretical, societal, and cultural demands over the past four decades is striking (Valero, 2004).

Building on the aforementioned context, this study delves into the training of educators within an indigenous education institution, seeking to characterize their knowledge base and the interconnectedness it shares with the indigenous community where the educational establishment resides.

Understanding Ethnomathematics

Ethnomathematics has emerged as a subject of exploration and engagement for educators, teacher trainers, researchers, and scholars in the field of mathematics. This term possesses a multifaceted nature, encompassing a range of meanings. D'Ambrosio characterizes ethnomathematics as:

> The mathematics practiced by cultural groups, such as urban or rural communities, groups of workers, professional classes, children of a certain age, indigenous societies, and many other groups that identify themselves by common objectives and traditions to the groups" (D'Ambrosio, 2001).

This definition highlights how various communities, including scientific ones, engage with mathematics in diverse ways.

Other researchers have associated ethnomathematics with marginalized groups (Skovmose & Valero, 2012; Bonilla et al., 2018), underscoring the notion that education is a human creation that should be accessible to all individuals, regardless of their language, cultural practices, or economic circumstances. However, numerous communities find themselves excluded from the knowledge, techniques, and structures of mainstream mathematics education. At this juncture, it becomes crucial to acknowledge alternative and ancestral mathematical practices, as they offer pathways for the emergence of group identity, cultural heritage, and historical narratives intricately intertwined with mathematical knowledge.

In Martínez's work (2013), Ascher and Ascher provide a definition of ethnomathematics as "the study of the mathematical ideas of people who are not literate, considering them inferior to those developed by Western culture" (Martínez, 2013). Gerdes (2007, cited by Martínez, 2013) proposes that ethnomathematics emerges at the intersection of cultural anthropology, mathematics, and mathematics education, highlighting the necessity of recognizing the existence of various mathematical systems across diverse cultures, with Western mathematics being just one among them. Meanwhile, in an interview conducted by Blanco, Bishop defines ethnomathematics as "the study of the relationships between mathematics and culture... it is the mathematics of the disadvantaged" (Blanco & Parra, 2009).

Blanco adds another dimension to the concept by asserting that within the realm of ethnomathematics, "different ways of understanding the world are possible, and therefore the claim to truth is not imposed but is understood and validated through consensus" (Blanco & Molano, 2021). Within the scope of this study, ethnomathematics is embraced as the examination of mathematical practices within specific communities, as they are integrated into learning dynamics driven by particular organizational needs.

In light of these perspectives on ethnomathematics, teacher training is deemed crucial for comprehending the ethnoeducational processes inherent to each culture involved. This engagement with the distinct characteristics of mathematical usage in school environments aligns with the concept of mathematization. Mathematization underscores the importance of teachers guiding students towards mathematics through the lens of their cultural context (Freudenthal, 2002; Steiner, 1968), thereby enabling students to connect their cultural realities to society and thereby identifying themselves within specific community practices. Some educators argue that, instead of immersing students solely in a single culture, a more holistic, global approach should be adopted, exposing students to a diverse array of cultural contexts (Tabares, 2016).

Balancing the integration of information and technology tools within mathematics education while preserving cultural traditions is of paramount importance. Jacanamejoy (2021) highlights that over generations, essential aspects of indigenous knowledge, such as customs, language, attire, and myriad traditions, have been gradually eroded. These vanishing traditions must be brought to light, countering an educational

paradigm centered on Western knowledge that dismisses alternative forms of knowledge as inferior. Ethnomathematics, in this context, offers a means of embracing knowledge that lies beyond the purview of Western tradition, reclaiming the potential for learning through a cultural lens that reflects the communities' identities.

Blanco's perspective aligns with this notion, asserting that ethnomathematics supports the struggle for and vindication of the mathematical knowledge held by the peoples of the Americas (Blanco, 2021). Fuentes (2019) elaborates on the oppressive dynamics that ethnomathematics aims to disrupt, aiming to revitalize and validate knowledge that was historically disregarded or dismissed (p. 26). This oppression is intertwined with pedagogical practices that neglect the richness of other cultures, propagate a single version of truth, and prescribe a uniform academic approach. The adoption of ethnomathematics challenges these oppressive patterns, fostering a more inclusive and diverse educational environment. Here, mathematics can be used to demystify a society and, from a critical perspective, contribute to a greater awareness of the social world and promote social justice (Brelias, 2014), which is so necessary in working with indigenous peoples.

In Colombia, educational institutions are granted autonomy to develop their own educational projects in accordance with their specific needs. This autonomy extends to educational institutions catering to ethnic groups, allowing them to incorporate indigenous knowledge, such as traditional medicine, dance, language, handicrafts, and agricultural practices, into their curriculum (Ministerio de Educación Nacional, 1994). The framework emphasizes that mathematics education should facilitate students' engagement with elements of their culture and the construction of shared social meanings. This approach, while rooted in indigenous cultures, also acknowledges the importance of universal mathematical knowledge (Ministerio de Educación Nacional, 1998).

While this regulatory landscape provides an avenue for inclusive curricular design based on indigenous cultures, it offers limited guidance on how educators tasked with this responsibility should be prepared. Despite the regulatory framework's potential for recognizing and integrating traditional and community-based education, it lacks specific parameters for the academic training of educators who will be responsible for implementing these approaches. This study aims to shed light on the training of teachers within an indigenous education model within a specific educational institution in the department of Cauca. The primary objective is to characterize the relationship between the teachers' knowledge and that of the Nasa indigenous community. Specifically, the study seeks to explore how teachers, operating within an institution with its own indigenous education model, establish connections and synergies between their own knowledge and the knowledge of the Nasa indigenous people. As an ethical consideration, the name of the institution remains undisclosed.

The research question guiding this work is: how do teachers working in an institution with its own indigenous education model understand the relationship between their knowledge and that of the indigenous community? Through this investigation, we aim to contribute to the broader discourse on ethnomathematics, teacher training, and the meaningful integration of indigenous knowledge within educational contexts. By examining the experiences and perspectives of teachers within this unique educational institution, we hope to uncover valuable insights that

can inform future approaches to culturally responsive and inclusive education in Colombia and beyond.

Context

The Nasa people primarily inhabit the territory of Tierradentro in Colombia, situated between the departments of Cauca and Huila. Additionally, some Nasa communities have settled in the Valley region of Tolima, while a smaller population has relocated to Putumayo and Caquetá.

> The ancestral homeland of the Nasa people is characterized as a natural triangle, encompassing the eastern foothills of the Central Andes mountain range and the hydrographic basins of the Páez and La Plata rivers to the south, as well as the Yaguará and Páez rivers to the east. This geographical area holds deep cultural and historical significance for the Nasa community (webpage: Organización Nacional Indígena de Colombia-ONIC, 2021)

According to the most recent Census conducted by the National Administrative Department of Statistics (DANE) in 2019, there are approximately 243,176 individuals who identify themselves as Nasa. The majority of this population, 88.6%, resides in the department of Cauca, specifically amounting to 164,973 people. In the broader context of Colombia, the Nasa people constitute around 13.4% of the total indigenous population.

The history of the Nasa people is marked by their determined resistance against Spanish colonization, even though parcels of their ancestral territory were subjected to colonization and missionization in the mid-16th century. Despite these historical challenges, the Nasa community has managed to maintain and preserve their cultural identity, traditions, and way of life within their territory.

In Nasa culture, profound reverence is directed towards spiritual entities such as Eekayhe', who envelops and bestows life energy, I'khwesx, the spirit responsible for transmitting gifts, and Ksxaw Wala, the guiding presence. The Nasa worldview envisions their reality as a collective household where all beings reside. According to Nasa mythology, the initial grandparents and parents inhabited another land, a singular home. Presently, as life originates on Earth, their current abode, the original ancestors serve as guardians and defenders of the Nasa world.

Central to the Nasa perspective is a complex interplay of symbols and beliefs that offer insights into their surroundings. This intricate framework permeates the community's political, economic, and social structure. The Páez people perceive their world as a layered structure, with "Yu" representing the subsoil, associated with death, cold, and impurity, while "Sek," representing the sun, symbolizes life, warmth, and purity (ONIC, 2021).

Coca holds significant sacred importance within Nasa culture, regarded as an essential element from cultural, religious, medicinal, and nutritional dimensions. The concept of harmony, known as "Wêt Wêt fxi zenxi," also holds great significance for the Nasa community. This harmony, emphasized by Hurtado (2015), underscores the fabric of unity, characterized by equilibrium, collectivity, and the interconnectedness of

individuals with nature. This stands in contrast to prevailing trends of globalization and individualism.

Indeed, the fabric woven by the Nasa people's cosmogony is intricately composed of six threads, each representing essential aspects of their cultural identity and worldview, as detailed by Hurtado (2015). These threads, akin to pillars of their existence, shape their understanding of life and guide their interactions with the world around them.

- *Cultural Practices*: Orality emerges as a prominent feature in this thread, embodying the transmission of ancestral wisdom across generations. This transmission helps avert imbalances, which are communicated through dreams, rainbows, and bodily signs. Preserving these practices ensures the harmony of both individuals and the collective community.
- *Rituals:* Serving as the second thread, rituals play a vital role in purging what disrupts harmony—the "dirty" elements—from the body, family, or community. Traditional healers, endowed with the ability to commune with nature's spirits, conduct these rituals to harmonize energies and offer tributes to Mother Earth.
- *Defense of Mother Earth:* The third thread revolves around safeguarding Mother Earth, regarded not as an inanimate entity but as a living being bestowing life and sustenance. The land and territory intertwine with all life forms, encompassing water, air, natural resources, and the growth that flourishes upon it.
- *Dance Practices:* Woven into the fabric as the fourth thread, dance practices are profound expressions of Nasa life. These dances, often symbolized by the spiral, find resonance in rituals and convey a sense of interconnectedness with nature, ancestors, and spirituality. They are marked by a sense of comfort and a joyful celebration of existence.

It's evident that these threads collectively create a rich tapestry of beliefs, practices, and connections that define the Nasa people's cultural identity and relationship with their surroundings. This intricate fabric weaves together various dimensions of their existence, from ancestral knowledge and healing rituals to their profound connection with the Earth and the joyous expression of life through dance.

The Nasa policy, constituting the fifth thread of the fabric, represents a commitment to preserving their identity, history, and rightful place as an original people. Rooted in their ancestral legacy, this policy is guided by core principles such as unity, territorial integrity, cultural heritage, and autonomy. It is a continuous practice that shapes their social framework and influences their interactions with the world, driving them to defend what rightfully belongs to them.

Health, forming the sixth thread, is intricately linked to the overall balance of the fabric. Cultural practices, symbolized by vegetable fiber ropes, serve to promote this thread. Rituals act as preventive measures, contributing to the well-being of both individuals and the Earth. When health is maintained, the defense of Mother Earth is reinforced. This harmony extends to dance practices, where a sense of ease and well-being is expressed. The Nasa policy further amplifies this cosmogony of

harmony, embodying the essence of Nasa culture. In summary, the fabric of Nasa culture is woven from these intricate threads, each representing a distinct aspect of their existence: cultural practices, rituals, defense of Mother Earth, dance practices, Nasa policy, and health. Together, these threads form a comprehensive tapestry that encompasses their identity, values, and interactions with the world, all while navigating the complexities of modern times.

Language plays a pivotal role in the preservation of Nasa culture. Nasa yuwe, their indigenous language, holds profound significance as a carrier of their heritage. Despite its importance, the status of Nasa yuwe is under threat. While approximately 60% of the Nasa community still uses the language daily, its usage has been declining due to various factors. Indigenous education schools have recognized the importance of teaching in the mother tongue, but challenges arise due to a shortage of qualified Nasayuwe-speaking teachers. This discrepancy highlights the struggle to maintain linguistic and cultural continuity in the face of modern challenges.

Over time, Spanish-speaking teachers often acquire proficiency in the Nasayuwe language, learning from peers who are more fluent and through interactions with their students. However, this process is not uniform, and some teachers may only learn basic greetings, phrases, and numbers up to ten. Despite varying language proficiency levels, these teachers may still be involved in teaching indigenous education, especially in areas where the native language has been marginalized or displaced (Ávila, 2018).

In the realm of the economy, the Nasa indigenous people predominantly engage in agriculture and livestock activities to sustain their livelihoods. An interesting cultural practice emerges in their agricultural practices, specifically in the cultivation of corn. The spiral planting pattern for corn is symbolic and practical. Unlike planting in straight rows where one plant overshadows the other, causing an imbalance and potential hunger, the spiral planting represents collective thinking and community benefit. This aligns with the Nasa people's ethos of working collaboratively, known as "minga," where each individual's contribution helps to the well-being of the entire community.

The concept of "trueque," or barter, is deeply ingrained in Nasa culture and serves as a common economic activity. It involves individuals exchanging food items based on their surplus and needs, thus expanding the diversity of their basic food resources. This practice embodies communal support and interdependence, reflecting the Nasa people's commitment to sharing and solidarity within the community.

In essence, both language acquisition and economic practices are integral aspects of Nasa culture, showcasing their adaptability, collective values, and the intricate ways in which their traditions influence various facets of their lives.

Methodology

The research undertaken aimed to provide insight into the training and knowledge of teachers within an educational institution that follows an indigenous education model. This institution is situated in the Departments of Cauca and caters to a diverse student body, including mestizo, Afro-descendant, and indigenous students from the Nasa community. To achieve this goal, the study employed a

discourse analysis approach, which involved conducting semi-structured interviews with the teachers working at the institution.

The teachers themselves play a crucial role in shaping the research's theoretical framework. According to van Dijk (2019), participants like the teachers not only contribute to the theoretical definition but also influence the broader context through their discourse. In other words, the contexts in which discourse occurs are not studied in isolation, as social scientists might typically do, but are instead examined to gain a deeper understanding of the discourse itself.

This research is characterized as qualitative and exploratory. Qualitative research focuses on understanding, describing, and sometimes explaining social phenomena from various perspectives. In this case, the study aims to delve into the nuances of the training and knowledge of teachers in the context of indigenous education, providing a richer and more comprehensive understanding of their experiences and perspectives. This approach allows for a more holistic exploration of the subject matter, capturing the depth and complexity of the teachers' engagement with the indigenous education model and its implications.

By employing discourse analysis and adopting a qualitative and exploratory approach, the research seeks to uncover insights that contribute to a deeper understanding of the interplay between teacher training, indigenous education, and the knowledge dynamics within the Nasa community.

To gather the necessary information, a semi-structured interview approach was employed, involving 10 teachers currently employed at the Educational Institution under study. The interview process followed a set of predefined questions that were organized into categories, focusing on both the characterization of the teachers themselves and their relationship with the knowledge of the Nasa people. One of the key advantages of this approach is its flexibility, allowing for the emergence of new questions during the course of the conversation. This adaptability ensures the collection of reliable qualitative data while accommodating the participants' perspectives, addressing uncertainties, and minimizing rigid formalities in the process (Díaz et al., 2013).

The transcripts of these interviews serve as the primary data source for the study and are subjected to discourse analysis methodology. The central objective of discourse analysis is to uncover, describe, and comprehend the effects and forms through which discourses generate meaning. The focus of this analysis is on the construction of meaning within the discourses, and the examination is carried out within the context of the overarching research goal – characterizing the teachers and elucidating the connections between their knowledge and that of the Nasa people.

By employing discourse analysis, the study aims to explore how meaning is produced, expressed, and shaped through the conversations held during the interviews. This method allows for a comprehensive understanding of the teachers' perspectives, experiences, and interactions with the Nasa knowledge, shedding light on the ways in which their training and engagement with indigenous education influence their perceptions and relationship with the indigenous community's knowledge.

Participants

The study involves a total of 10 participants who are educators at an educational institution situated within the *Pickwe Tha Fiw* indigenous reservation in the Cauca department. The institution's history dates back to its establishment in 2003, initially enrolling students from three distinct indigenous communities and a smaller segment of the local peasant population. However, after a period of twelve years, one of the indigenous communities made the decision to establish its own separate school, resulting in the retention of students solely from two of the original communities.

The participants in this research are drawn from the pool of educators working within this particular educational establishment. They represent a diverse group of professionals who are engaged in the unique educational context of the *Pickwe Tha Fiw* indigenous reservation, and their perspectives and experiences are central to the investigation of the training and knowledge exchange between teachers and the Nasa indigenous people. Through their insights and interactions, the study aims to shed light on the dynamic relationship between the teachers' training and the indigenous community's knowledge.

The teachers who voluntarily participated in this research were assigned a code between 1 and 10, their characterization is presented in Table 1.

Table 1. *Characterization of Participants by training, Language and Length of Service*

Teacher	Teacher training institution	Obtained title	Languages they speak	Time of service
1	Universidad Distrital Francisco José De Caldas	Bachelor of Basic Education with an emphasis in Mathematics	Spanish	3 months
2	Corporación Universitaria del Huila	Environmental engineer	Spanish	3 years
3	Universidad del Cauca	Biologist	Spanish	3 years
4	Servicio Nacional de Aprendizaje Sena (Valle del Cauca)	Environmental control technician	Spanish	11 years
5	Universidad Surcolombiana	English graduate	Spanish - Nasa yuwe	18 years
6	Sena	Environmental control technician	Spanish - Nasa yuwe	11 years
7	Institución educativa agroforestal satwesx zuun	high school graduate	Spanish - Nasa yuwe	8 years
8	Universidad autónoma de Popayán	Professional in sport and physical activity	Spanish	Less than a year
9	Universidad	Degree in Literature	Spanish	Less than a

	Surcolombiana Neiva	and Spanish Language		year
10	Normal superior Quiguanas	Normalista[1]	Spanish	4 years

Source: Authors. The gender of all participants is male.

The process of selecting teachers to work within the educational institution is a community-driven and multi-step procedure. Prospective teachers submit their resumes to the school secretary, and a collective assembly involving the community members is convened to make the final decision on the selection. Among the criteria considered during the selection process are candidates' familiarity with laws and policies directly relevant to the community, as well as a strong political background and understanding of social processes. If the community provides its endorsement, the applicant proceeds to an evaluation conducted by the Nasa Çxhãçxha association of ancestral territorial authorities. This evaluation encompasses various aspects such as political knowledge, general knowledge, understanding of customs and traditions, pedagogical skills, and the specific educational emphasis they intend to bring. For those who are proficient in the Nasayuwe language, part of the evaluation may be conducted in Nasayuwe.

Once a candidate is chosen for the teaching role, the educational institution is responsible for providing them with an induction process that focuses on their own cultural heritage. Notably, not all teachers are fluent in the Nasayuwe language, and there currently exists no formal program to facilitate their language learning. It's also worth highlighting that there has been a decline in the Nasayuwe-speaking student population, which now constitutes approximately 10% of the institution's total.

In response to these challenges and to promote the revitalization of native languages, the Intercultural Indigenous Autonomous University (AUAIIN) has been active in the region. AUAIIN is working towards preserving and promoting native languages through initiatives such as offering a Bachelor's Degree in *Pedagogy for the Revitalization of Native Languages*. This underscores the broader effort to support linguistic diversity and cultural heritage within the community. Didout (2015), emphasizes the possibility that indigenous people can study at a university that takes their culture into account.

Analysis

The semi-structured interviews conducted with the teachers yielded specific and detailed information. Once these interviews were transcribed, the resulting speech formed the corpus of data to be analyzed. The discourse analysis focused on several key aspects, each providing insights into the teachers' perspectives and experiences within the context of indigenous education. These aspects included:

[1]High school graduate with an emphasis in education.

1. Formation and Relationship with Indigenous Education: The analysis delved into the teachers' educational backgrounds, training, and experiences related to indigenous education. It aimed to understand how their preparation and personal journeys influenced their role within the institution.
2. Research in Education: This aspect explored the teachers' engagement with educational research, particularly as it related to indigenous education. It sought to uncover their involvement in scholarly activities that contribute to the enhancement of teaching practices and the overall educational experience.
3. Appropriate Knowledge of the Nasa Community: The analysis examined the teachers' level of familiarity and understanding of the Nasa community's culture, traditions, and ways of life. It aimed to assess how well their knowledge aligned with the community's values and needs.
4. Doing Mathematics: This aspect focused on the teachers' approaches to teaching mathematics within the indigenous education model. It aimed to uncover their teaching methodologies, strategies, and beliefs about mathematics education.
5. Traditions Permeated by Mathematics: The analysis explored the intersection of traditional Nasa practices and mathematical concepts. It sought to identify instances where mathematics was embedded within cultural traditions and rituals.
6. Importance of Mother Nature in Indigenous Education: This aspect delved into the teachers' perspectives on the role of nature, environment, and sustainability in indigenous education. It aimed to uncover how these concepts were integrated into their teaching and the broader educational philosophy.

By examining these facets of the teachers' discourse, the analysis aimed to provide a comprehensive understanding of their experiences, beliefs, and practices within the context of the indigenous education institution. It sought to reveal both explicit and implicit themes that contribute to the complex tapestry of indigenous education and its relationship with the Nasa community.

Undergraduate training and Relationship with Indigenous Education

In the interview, it was possible to notice that teachers use Western knowledge from their training and relate it to what is offered by the community to generate a new knowledge that is not exclusive between peoples, but rather integrates them and provides new ways of understanding the reality. They adapt them so they can be used in this type of education. For example, Teacher 2 mentions:

> (1) I guide the area, or the learning path that is called bioterritoriality, which is parallel to natural sciences, but applied to the territory, which practically goes from cycle four to cycle six, which would be sixth to ninth grade, and physical chemical transformations and spiritual, which is cycle seven and eight, which would be the tenth and eleventh grade. The training I have, I am a biologist from the University of Cauca (T2),

Although in the Colombian General Education Law of 1994, there is no specific allusion to a subject called "Bioterritoriality", this teacher mentions the link between natural sciences and bioterritoriality, as part of the curriculum of the institution in

which he practices. In this way, Western knowledge of science dialogues with indigenous knowledge about the context and is taught through this subject.

In addition, Teacher 8 (T8) alludes to how their previous knowledge should be transformed in a certain way.

> (2) "that parallel was also made, of how the rainbow is perceived from the scientific explanation and how it is perceived from the Nasa knowledge"(T8),

Here we evidence a process between science and tradition, carried out by this teacher, trained in the city, who has been taught "that the rainbow arises as a result of the sun's rays illuminating small drops of water forming the spectrum of the seven colors" and, upon reaching the community, he finds that the rainbow for the Nasa is much more than that. The indigenous have respect for the rainbow since it can give an invaluable gift, also, it is found within the oral tradition that when the rainbow hits a person, they can die.

Research in Education

The teachers express the importance of educational research in the training processes and in the preservation of the knowledge of the Nasa community. They mention the following difficulties to achieve this: not having a solid training to carry out research, lack of systematization of the knowledge of the elderly. They emphasize how they carry out the dialogue about Western research and Nasa knowledge.

In the interview with Teacher 7, research is evidenced as an aspect for teachers to be updated,

> (3) "one has to find a way to do a lot of research because the training process is really about research" (T7)

Here the teacher has the desire to investigate, he considers that research is important in the training process, however, it seems that during his training process as a teacher, he did not have spaces to carry out this work. Furthermore, he claims that:

> (4) "The knowledge that we have acquired in the big house in this training process has led us to think about different things that should also make a transformation from the community" (T7),

understanding by "Casa Grande" the community in general, which is recognized as a valuable source of information that allows the transformation of the community, even when it is evident that what is desired has not been achieved in terms of changes.

The same teacher talks about the practical exercise

> (5) "As satwesx zuun, we have been leading the way and we continue to carry out different activities, not only from a practical exercise but also from a spiritual one." (T7),

this confirms that they have already begun the path to carry out the transformation referred to in the previous point, only that they lack the bases to develop it. It could be thought that these are related to the investigation of indigenous knowledge, as he himself affirms,

> (6) "something very interesting that the ancestral experts handled in all these activities is that they have a lot of knowledge, but nevertheless, it is still difficult for one to start sitting down with them and start writing. I believe that the greatest difficulty that we indigenous people have is to write" (T7),

within an investigative process, systematization allows the organization and analysis of data, which is what this teacher mentions that is not being done. There is oral tradition, the knowledge of the knowers, however, it is not written, it is not systematized due to a limitation of writing.

According to the previous scenario, the lack of systematization of ancestral knowledge, Teacher 5, mentions that,

> (7) "We can talk, for example, about traditional medicine, the nine points where indigenous doctors feel their signal. The speed with which one jumped here, the speed, the distance, all this has a different meaning that has not been organized, that has not been investigated." (T5),

which implies that valuable knowledge is recognized for the Nasa community, functional, that must be investigated and explored through Western scientific research methodologies, especially in the identification of a disease and/or its cure.

Another participant, Teacher 3, from his knowledge mentions that they should do research to be clear about certain traditions of the community,

> (8) "from the Nasa vision it is important what incidence it has in each one of the people depending on their lunar moment. If the investigative process is carried out to compare at what lunar moment they were born and what is their way of being, of expressing themselves, what abilities they have and their character, how it works, then, it allows us to know that part" (T3),

From the lunar phases, the research for this teacher is related to the comparison and dialogue between astronomical phenomena (Western culture) and the reading that is carried out with the Nasa people with the lunar influence in the construction of the personal characteristics of the subject. As mentioned by Tabares (2016), the Nasa culture takes a holistic and global look, by not staying only with its own knowledge but inquiring about others.

Knowledge apprehended from the Nasa Community

The Nasa worldview has been apprehended by mestizo teachers and strengthened in Nasa teachers. This is evident throughout the interview, when they mention knowledge of this town that explains and characterizes their actions. They talk about how the economy not only responds to the generation of an economic good but also

to the development of cultural practices that are related to the fabric and how the development of personality is associated with the lunar phases.

Some have acquired this knowledge about the Nasa worldview throughout their lives since they are part of this culture, others have gradually acquired it during their time at the institution, for example,

(9) "It has four fabrics, because of these fabrics we have: 1- ancestral thought and memory, 2- economy territory, 3- spirituality worldview and 4- society and authority" (T9),

For the Nasa people, weaving has had great relevance since for them it is more than a technique to produce hats, ruanas or backpacks, it also means social fabric, from their political and community actions, established in the principle of unity, which can be seen reflected in the mingas (great community work), Hurtado (2015). He also alludes to the importance of weaving within what he called harmony, which is made up of six practices typical of the Nasa people, so that weaving, apart from promoting mathematical thinking, contributes to the strengthening of culture.

Do mathematics

The teachers of the educational center, agree that mathematics is a cultural practice that allows to continue transmitting traditional knowledge from generation to generation, regardless of the formal institutionalization of the discipline. In other words, it does not necessarily have to be formulated under a curriculum, therefore, the community continues to have access to this indigenous mathematical knowledge, not only through the school, but through various activities such as planting, weaving, and native games.

For teachers, doing mathematics is an activity that takes place within a context in which the learners are immersed, as indicated by the teacher 10

"mathematics is involved within any social or playful context that we represent" (T10)

We can show that for this teacher it is important to take mathematics out of the classroom and take it to a more playful environment in order to enrich the development of mathematical processes in students.

(10) "If we suddenly take them to my context, which are native games, mathematics is involved at all times" (T10),

Taking into account that students are motivated by the game and that this contributes to strengthen the taste for mathematics, native games such as balance, zumbambico, spiral, arrow, among others are promoted.

They manifest the presence of mathematics not only in places but also in their practices. In this regard they mention:

(11) "Well, it is in production, in the territory. And since the economy is in the territory, well, there, what we work is in the part of different crops," (T10)
(12) "Also, it is useful knowledge for the economy of comunity, since it allows more efficient sowing and weaving, (T2)

(13) "There are many types of fabrics, the hypogea also have, so one can find many geometric figures of all kinds" (T9).

On the other hand, considering mathematics as an opportunity for the development of thought, stating that it allows developing strategies to solve everyday problems and is not just a compendium of knowledge.

(14) "mathematics is not only numbers, but mathematics is the development of thought, the way I solve situations that give me the same daily environment" (T3),

here mathematics is present in reality, it is a tool for solving situations where they need to measure, count and calculate.

Traditions Permeated by Mathematics

The teachers of this institution mention different ways in which the ancestors used mathematics, Teacher 3 affirms that

(15) "The older ones transform many things to have a tool or an input that they use to transform products, the elaboration of trapiche, the handling of clay or the management of time. An example is the part that has to do with your own measurements such as the fourth, the geme, the fingers, the feet. To measure weight, they were made with weights equivalent to x number of eggs. Time was measured with chew or mambíadas".(T3)

This allows us to understand how science has never been absent from indigenous thinking and feeling. In addition, recognize its origin from the ancestral, contribute to knowing that mathematics is born and develops in response to your needs. For example, ancestral measurement practices, where the human body has played an important role in the creation of measurement patterns (Blanco 2006; Blanco 2017; Carabalí, 2012; Moran & Acosta 2015). Taking into account that the measurements used by the Nasa people are not 100% accurate, it can be said that they work very well for their context, since they are supported by the fabric of trust and are used in activities such as barter, which is an act of collaborating, sharing and community, in which its main purpose is to help another person.

Importance of Mother Nature in the Development of Indigenous Education

For indigenous peoples, Mother Nature is their everything, therefore, for this type of education it is extremely important to be able to transmit that to their students, as the teacher 1 tells us

(16) "One of the areas that this institution focuses on is the conservation of Mother Nature, where students are taught the importance of planting a tree and being protectors of the mountains where the water consumed by the community in general is born." (T1)

Here it is highlighted how for teachers and for the educational community in general the conservation of Mother Nature is paramount. Teacher 2 explains a little about his exercise within the community.

> (17) "What I teach is to make the student understand what our position is as a human species in nature... make them understand that we are not unique nor are we the ones above other species or anything like that, but that we are part of this... it can be seen that here we are talking about a relationship of equal to equal where we have the duty to protect our environment. As the focus of the institution, of the big house, is on the pedagogy of mother earth, which is mother nature, so we work on how it manages in its environment and how it is constituted, how they relate to each other, how they live together and how it is contributed" (T2)

Here the importance of mother nature is reflected from indigenous education and weaving, where we are all important without hierarchical relationships. In addition, the teacher mentions the following

> (18) "here there is also a center that is the spiritual center, and spirituality revolves around that. Western science teaches you that a rock or a specific place has no life, but if you are in the territory, they teach you spirituality... and you realize that everything that lives in the environment has life" (T2).

This is an affirmation that allows us to understand the respect that indigenous peoples have for Mother Nature, since for them everything that lives with her has life and has respect for the peoples.

Results

The insights provided here highlight several critical aspects and challenges within the realm of indigenous education in Colombia. Let's unpack some of these key points:

1. Quality and Training: Indigenous education in Colombia is regulated and emphasizes the importance of quality education for indigenous communities. However, there is a significant gap in the training of teachers to effectively implement the indigenous education model. While there is a willingness among teachers to work with indigenous communities and a strong sense of dedication, the lack of comprehensive training in ethnoeducation and ethnomathematics is evident. This deficiency points to the need for universities to incorporate these crucial components into teacher training programs, thereby equipping educators with the necessary conceptual tools to engage more effectively with indigenous cultures and their knowledge systems.
2. Language and Cultural Knowledge: Language and cultural knowledge are pivotal in indigenous education. The presence of Nasayuwe-speaking teachers and the significance of the Nasayuwe language highlight the importance of preserving and transmitting indigenous languages. The presence of a

Nasayuwe-speaking teacher who belongs to the community and has a background in indigenous education is a positive example of the potential impact of culturally rooted education. It also underscores the value of community-based education in maintaining cultural integrity.

3. Teacher Turnover and Learning Loss: The issue of teacher turnover and the loss of trained human resources is a critical concern. Each time a teacher is replaced, valuable community-specific knowledge and understanding must be relearned, leading to potential learning loss for both teachers and students. This cycle of turnover emphasizes the need for stable, well-trained educators who can establish deeper connections with the community and contribute to a more continuous and consistent educational experience.
4. Role of Indigenous University: The presence of an Indigenous University that aims to train indigenous teachers for community intervention is promising. However, the fact that there are no teachers graduated from this university within the studied institution suggests that there might be barriers or challenges hindering the flow of graduates into the community. Efforts to bridge this gap and increase the enrollment of indigenous teachers from the university into local institutions could contribute significantly to enhancing the quality of indigenous education.
5. Deficient continuous training for teachers: The broader issue of insufficient training for teachers in indigenous education is a systemic challenge that requires comprehensive solutions. The need for greater emphasis on ethno-education within teacher training programs is evident to ensure that educators are equipped to work effectively in culturally diverse settings and engage with indigenous knowledge systems.

These findings shed light on the complex landscape of indigenous education in Colombia, highlighting both the dedication and challenges faced by educators. The recognition of the need for improved training, the preservation of indigenous languages and cultural knowledge, and the importance of stable and culturally competent educators are crucial steps toward creating a more impactful and sustainable indigenous education system. Addressing these challenges requires collaborative efforts among educational institutions, indigenous communities, and policymakers to ensure that quality education is provided while honoring and integrating indigenous cultures and traditions.

Conclusions

The insights gathered from the interviews provide a deep understanding of how the indigenous education model is practiced and embraced within the institution. The following are some key are some key takeaways from this work:

1. Learning Paths vs. Subjects: The indigenous educational model deviates from the curricular structure by subjects, traditional in Western education. Instead, it employs the concept of "learning paths." These learning paths are intricately woven into the fabric of the indigenous education model, representing different

aspects of indigenous culture, spirituality, economy, and society. Each path provides a holistic approach to education that integrates various dimensions of life.

2. Four Fabrics of Education: The educational model is built upon four fundamental fabrics: ancestral thought and memory, worldview and spirituality, territory and economy, and society and authority. These fabrics serve as the foundational elements from which the learning paths emerge. This structure reflects the interconnectedness of different aspects of indigenous life and knowledge.
3. Cultural Appropriation and Transformation: Despite the majority of teachers not being indigenous themselves, they have actively engaged in the process of appropriating and integrating indigenous culture into their pedagogical practices. This appropriation involves a transformation of their existing knowledge and teaching approaches to align with the indigenous education model. The teachers have navigated this transformation by finding a balance between their Western training and the ancestral knowledge of the Nasa people.
4. Learning Journey and Challenges: The teachers' engagement with the indigenous education model is characterized by a learning journey. They have undergone a transition process, acquiring new knowledge and perspectives related to the indigenous worldview, culture, and spirituality. This journey has required them to adapt their teaching methods and approaches, while also respecting and integrating the indigenous knowledge systems. The teachers' experiences highlight the challenges and opportunities inherent in bridging different knowledge systems.
5. Growing Strength of Indigenous Education: The indigenous education model has been gaining prominence and strength in recent years, with more indigenous communities adopting this pedagogical approach. The institution under study has emerged as a significant benchmark for indigenous education within the Department of Cauca. This recognition and influence bring a sense of pride to the entire educational community, validating the efforts put into implementing and advancing indigenous education.

Overall, the insights provided emphasize the complex and dynamic nature of indigenous education within the institution. The teachers' willingness to embrace and adapt to this model, despite challenges, reflects their commitment to fostering a culturally sensitive and holistic educational experience that resonates with the Nasa people's way of life. As indigenous education continues to evolve and expand, it holds the potential to empower future generations and contribute to the preservation and revitalization of indigenous knowledge, culture, and identity.

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